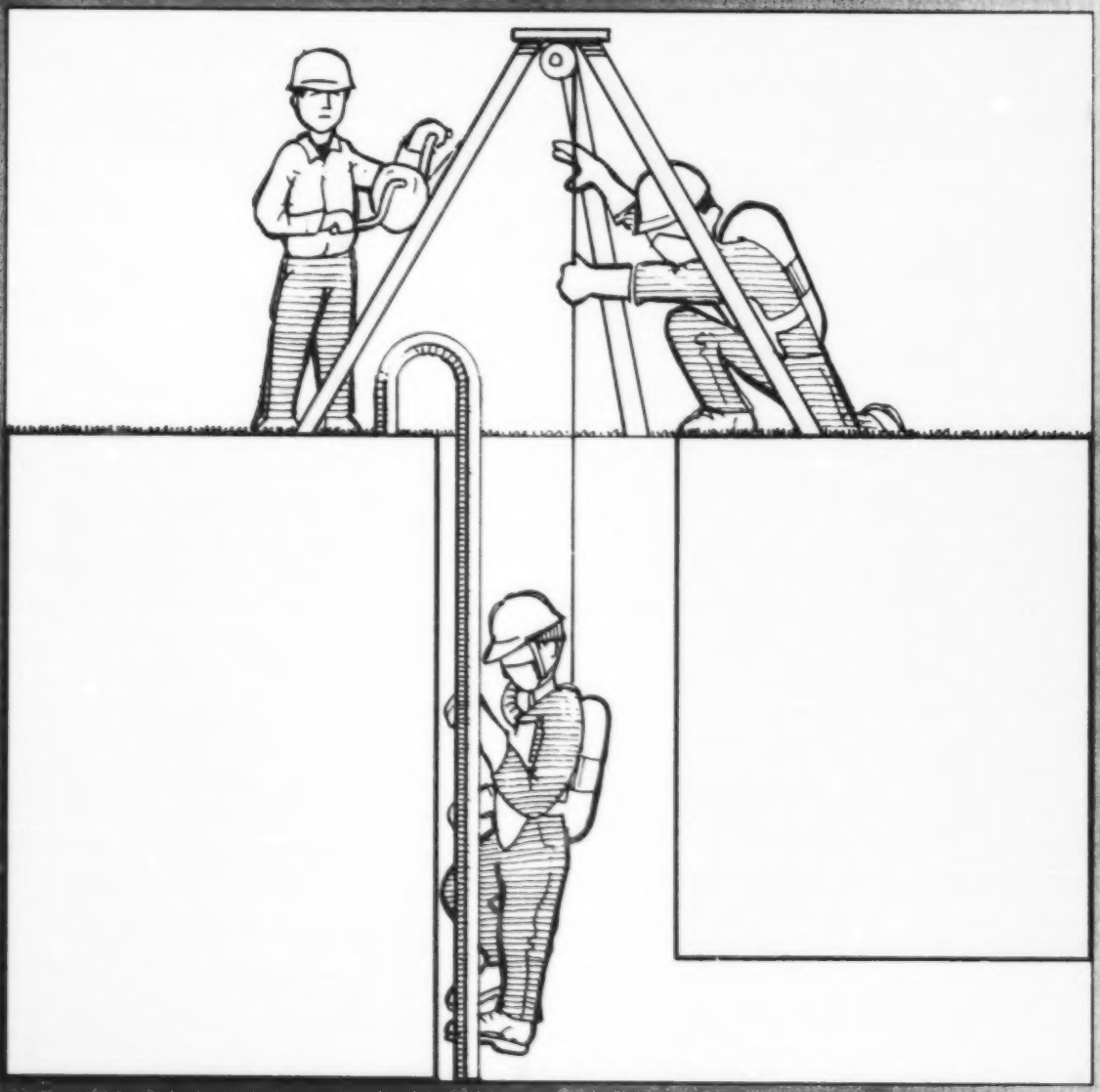
# Guidelines for Confined Entry Work



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# Guidelines
# For
# Confined Entry Work

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**Some of the material contained in this publication courtesy of the Industrial Accident Prevention Association, Construction Safety Association of Ontario, Workers' Compensation Board of British Columbia.**

# PREVENTING CONFINED SPACE ACCIDENTS

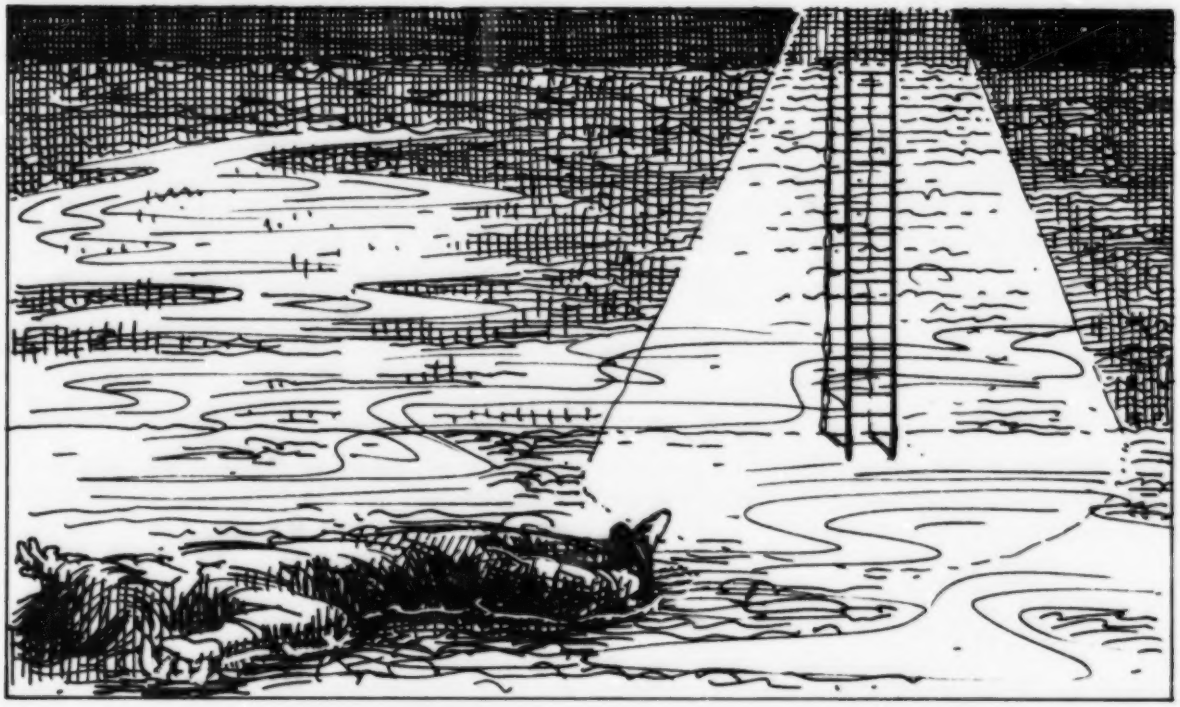
## PURPOSE OF CODE

**The Workplace Safety and Health Act states that it is the employer's responsibility to provide workers with information, instruction, training, supervision and facilities to ensure the workers' safety, health and welfare.**

**This code outlines the minimum requirements that must be considered for confined space work.**

## FATAL HAZARDS

1. Entering a tank without testing.
2. Inerting a space and not ventilating it.
3. Using an inert gas to force a liquid out of a tank.
4. Using welding hoses and valves without periodically checking out leakages.
5. Using oxygen to ventilate spaces.
6. Not investigating the effect of stirring up sludges in a confined space.
7. Using improper respiratory protection.
8. Not checking nearby processes for possible release of toxic or flammable material.
9. Welding in a tank without checking neighbouring compartments.
10. Not blanking out, locking out.
11. Leaving a space which has been tested safe for entry and re-entering it later without retest.
12. Improper rescue procedures.



**DEATH LURKS IN CONFINED SPACES**

## INTRODUCTION

Every year people die in confined spaces, often more than one person at a time. There is a need to:

1. **Identify** confined spaces.

2. **Train** workers in hazards and control measures.

3. **Implement** measures for control of hazards.

Entry into a confined space for cleaning, inspection, or maintenance, can be done safely if **proper hazard/risk assessment and precautions are taken.**

This code is designed to:

1. Assist in the **recognition** of confined spaces.

2. Assist in the **development of procedures** for entry into these confined spaces.

3. **Supplement a regular training program** for workers required to enter and work in confined spaces.

4. Assist members of **Workplace Safety and Health Committees** in identifying and making recommendations for hazard evaluation and control.

Confined spaces **must** be considered to be I.D.L.H. (Immediately Dangerous to Life and Health) until a complete hazard/risk assessment has been completed and appropriate control measures have been implemented.

## BASIC CONCEPTS

1. **Confined Space:** Refers to a work area which:

   - is not intended for continuous worker occupancy.

   - has by design, structure, location, limited or restricted entry and exit.

   - may contain or produce dangerous accumulations of hazardous gases, vapours, mists, dusts, fumes, fog, lack or enrichment of oxygen, biological agents faster than natural ventilation can remove the hazards.

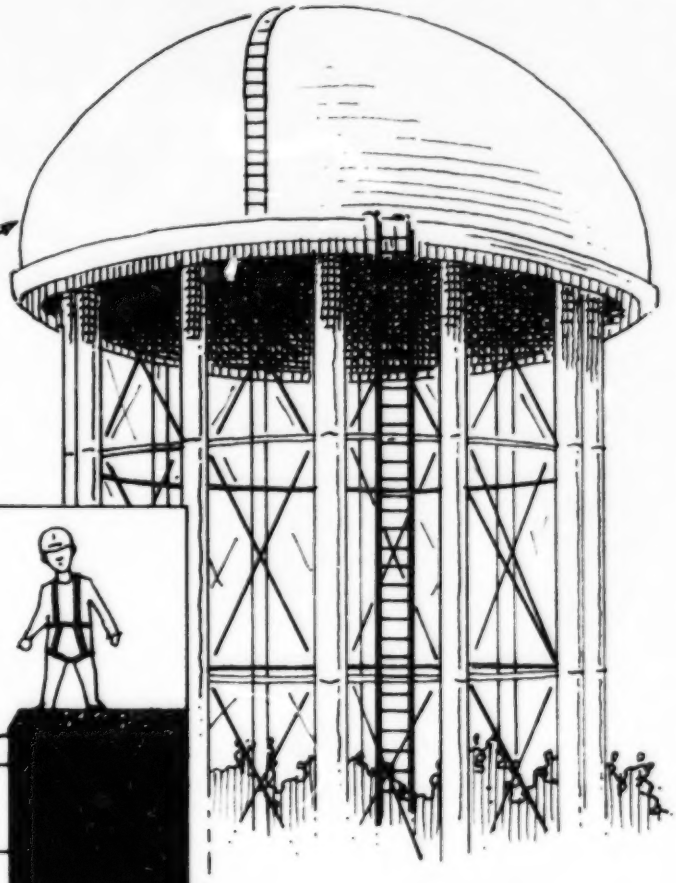
2. **Hazard/Risk Assessment:** Refers to the identification of all possible or potential hazards that may be found in a confined space. Risk assessment **must be performed before** any worker(s) enters the confined space.

## SOME EXAMPLES OF CONFINED SPACES

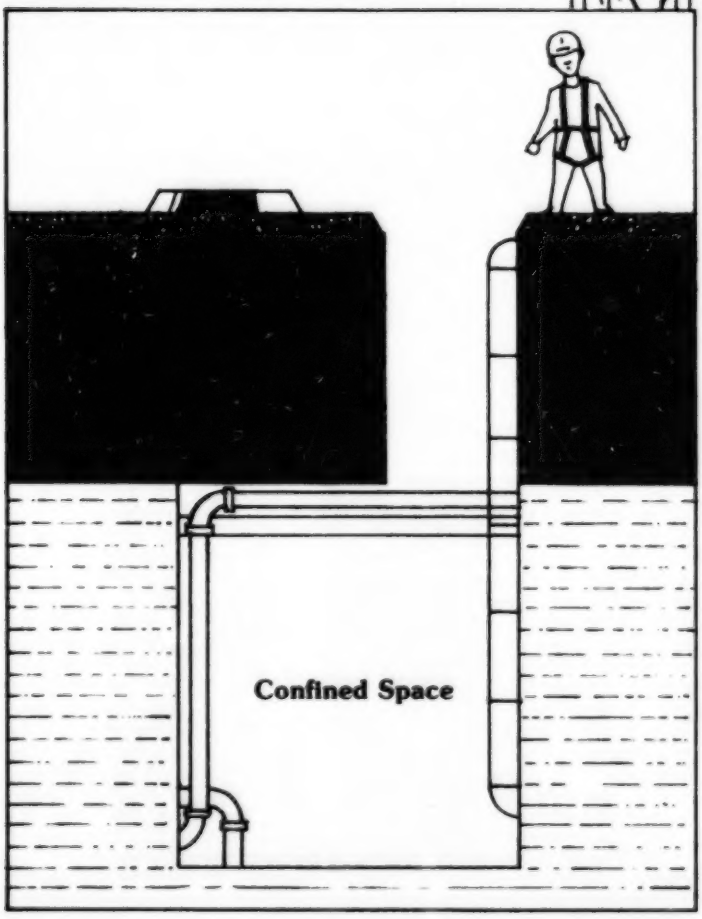
**Storage Tanks** - Above or below ground

- Rail

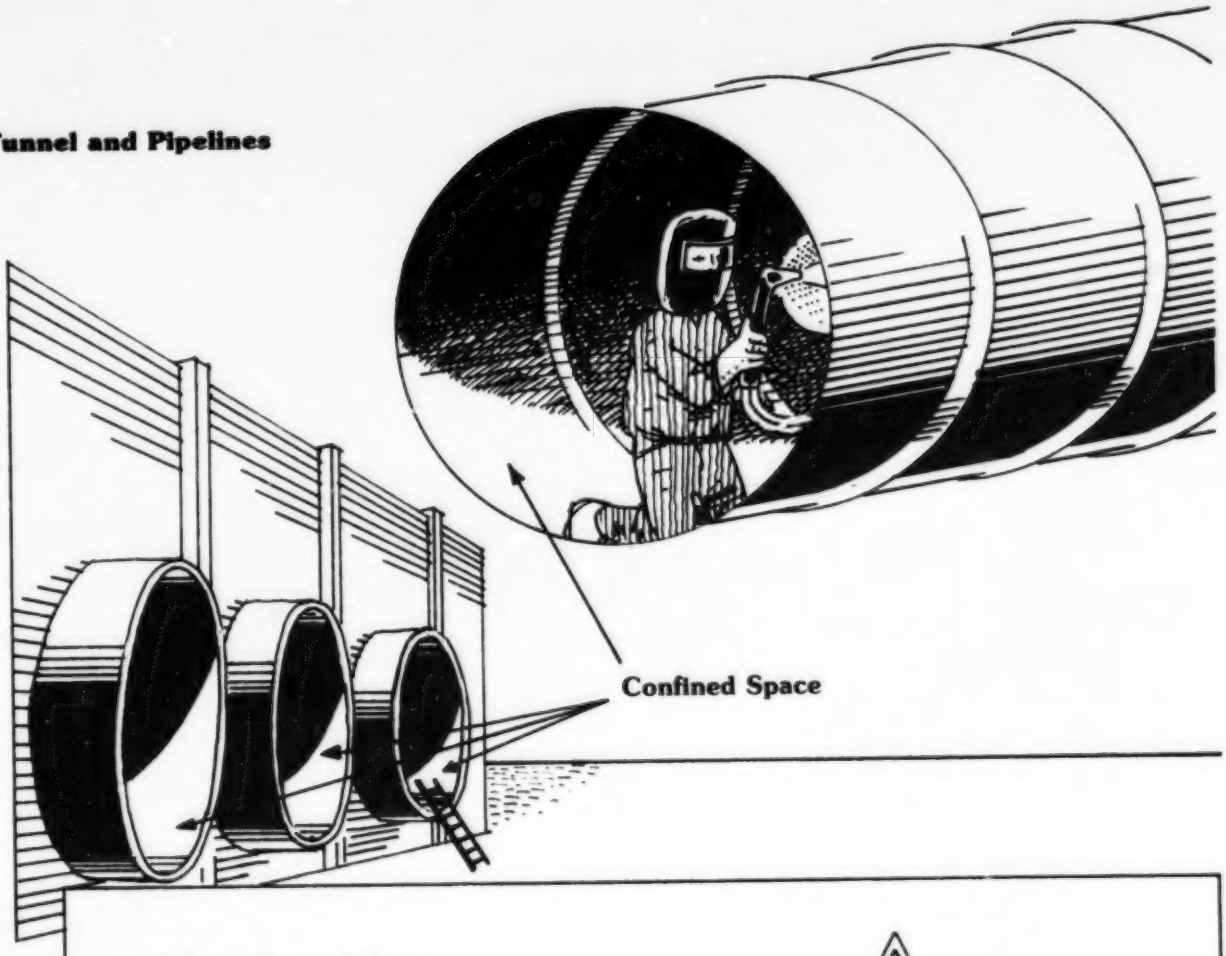
-Truck



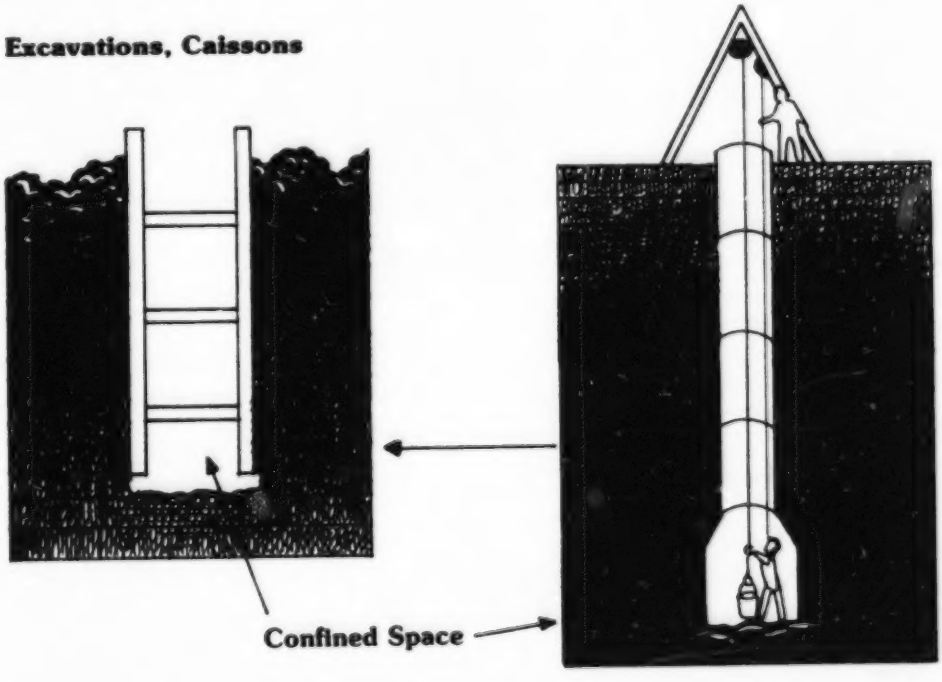

**Underground Utility Vaults**



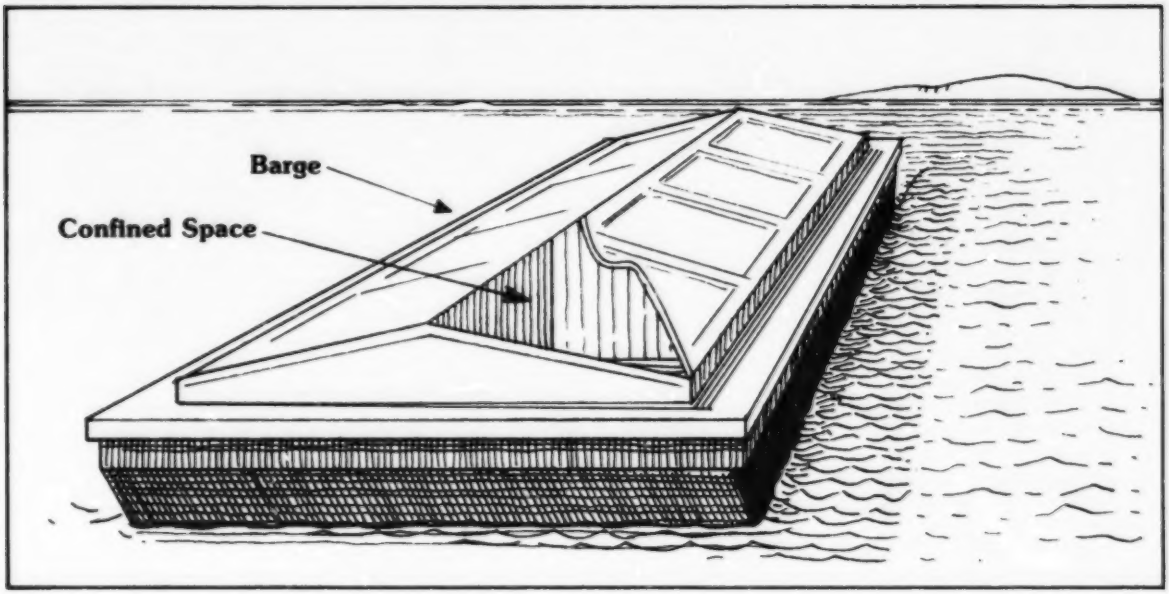
**Tunnel and Pipelines**



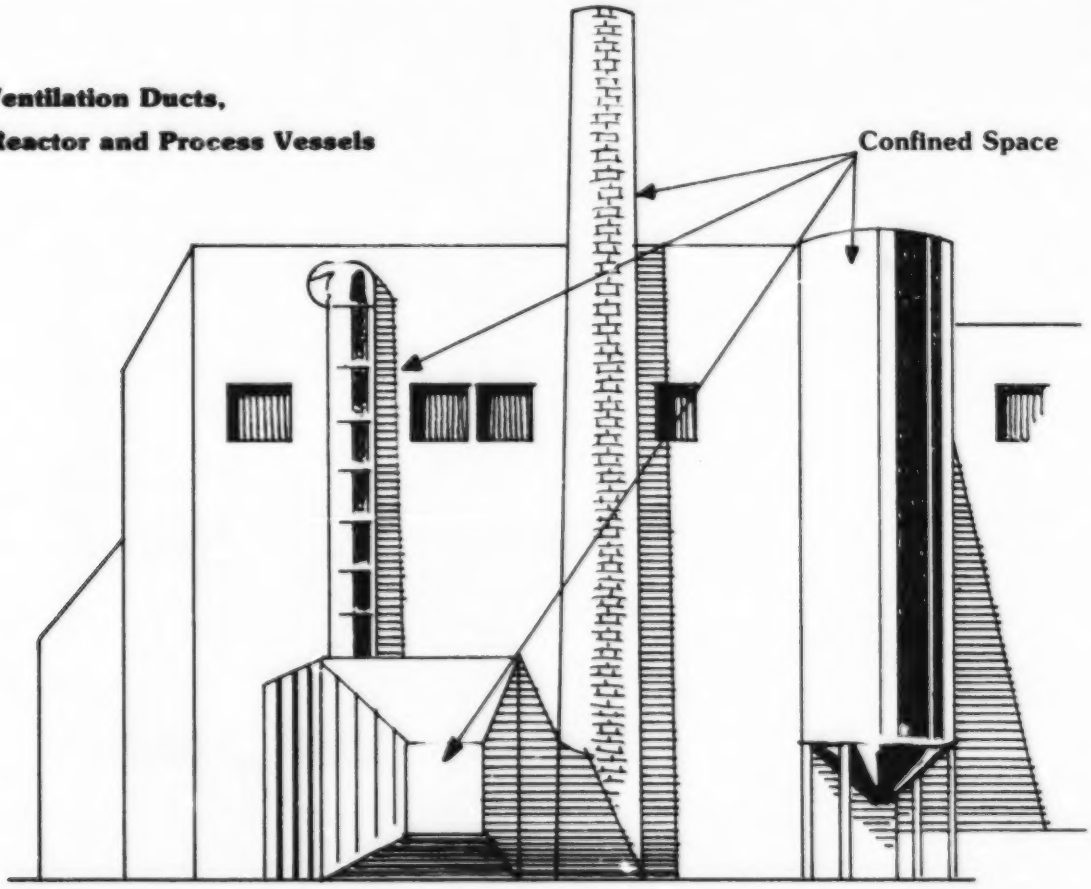

**Excavations, Caissons**



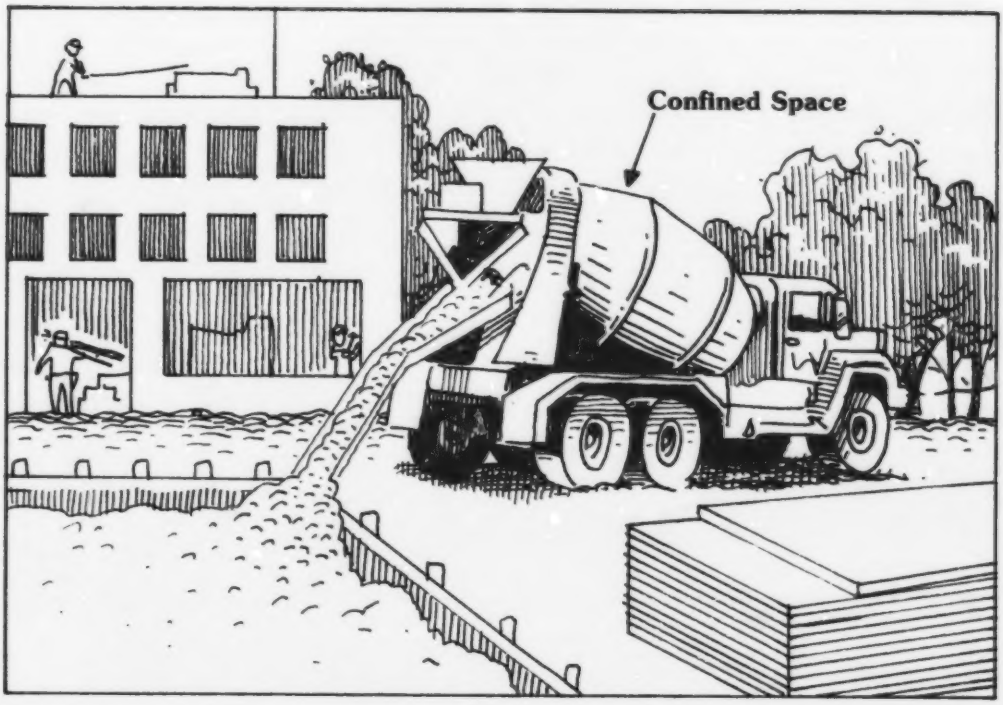
**Holds, Ballast Tanks of Barges and Ships**

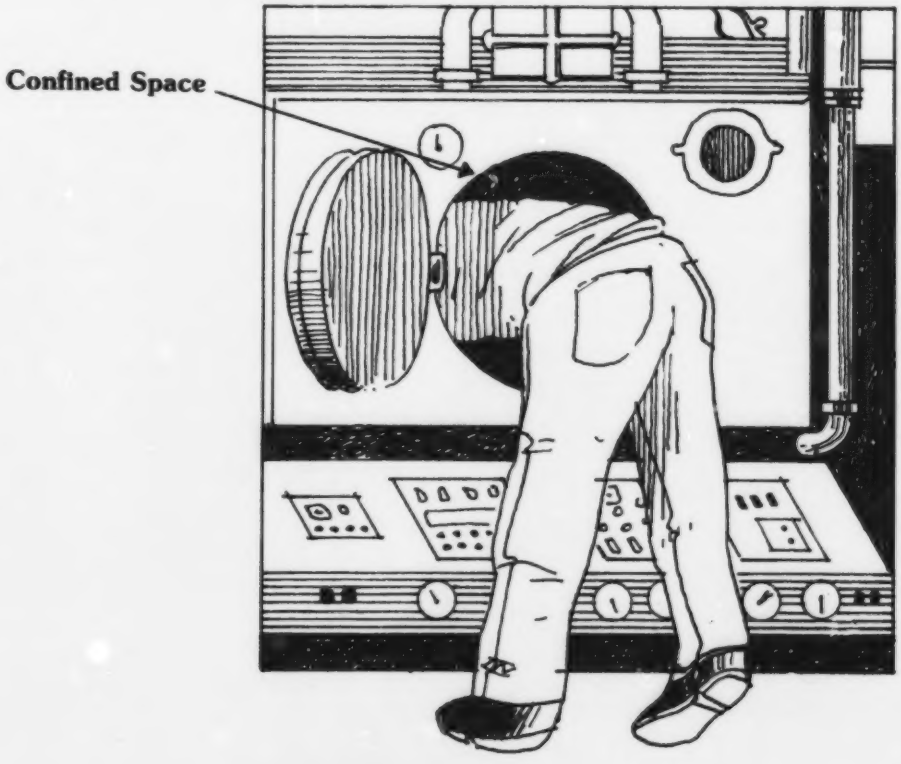



**Ventilation Ducts,**
**Reactor and Process Vessels**

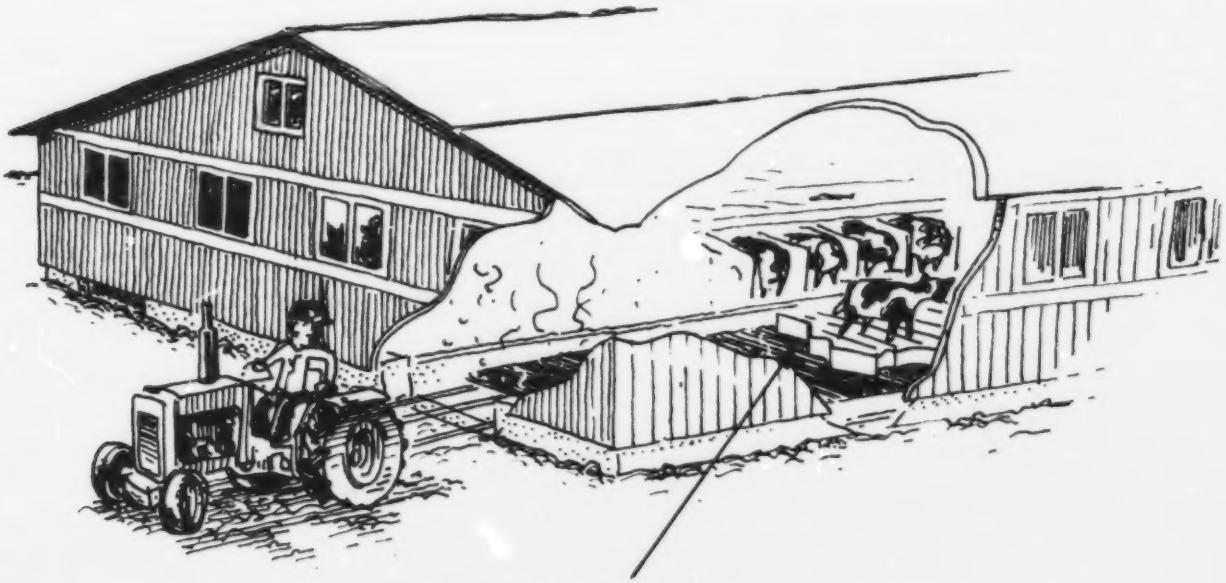


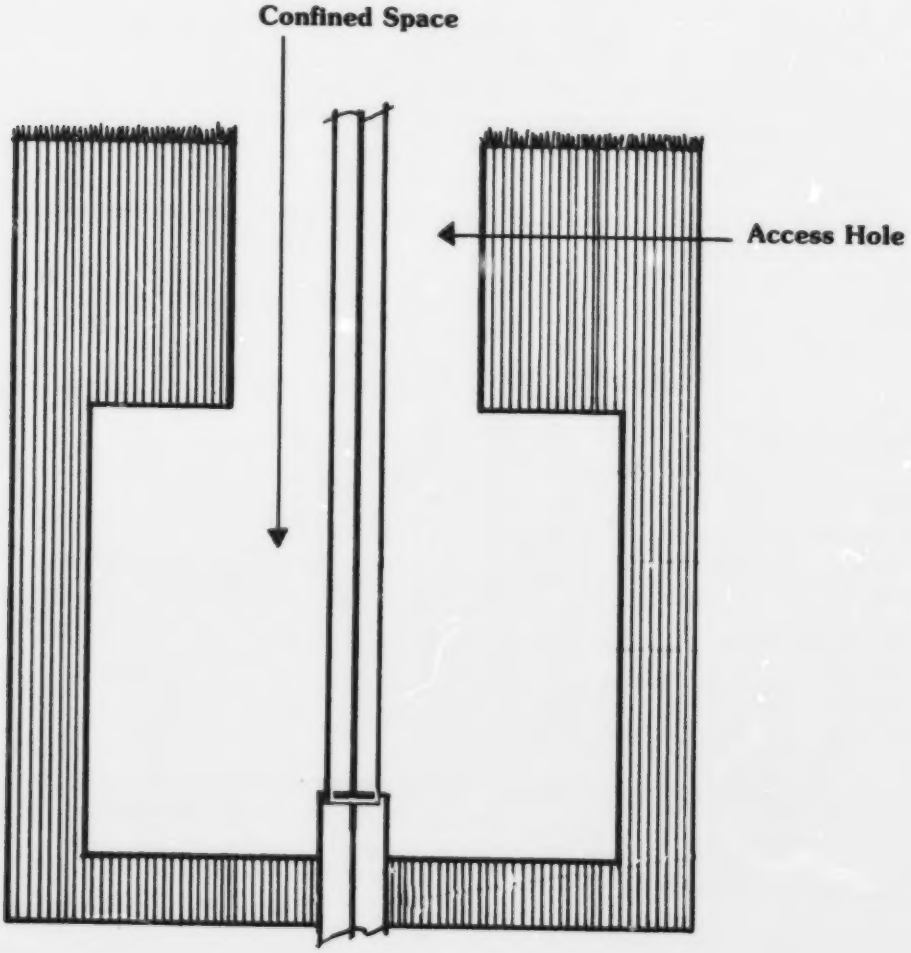
**Machinery and Equipment**



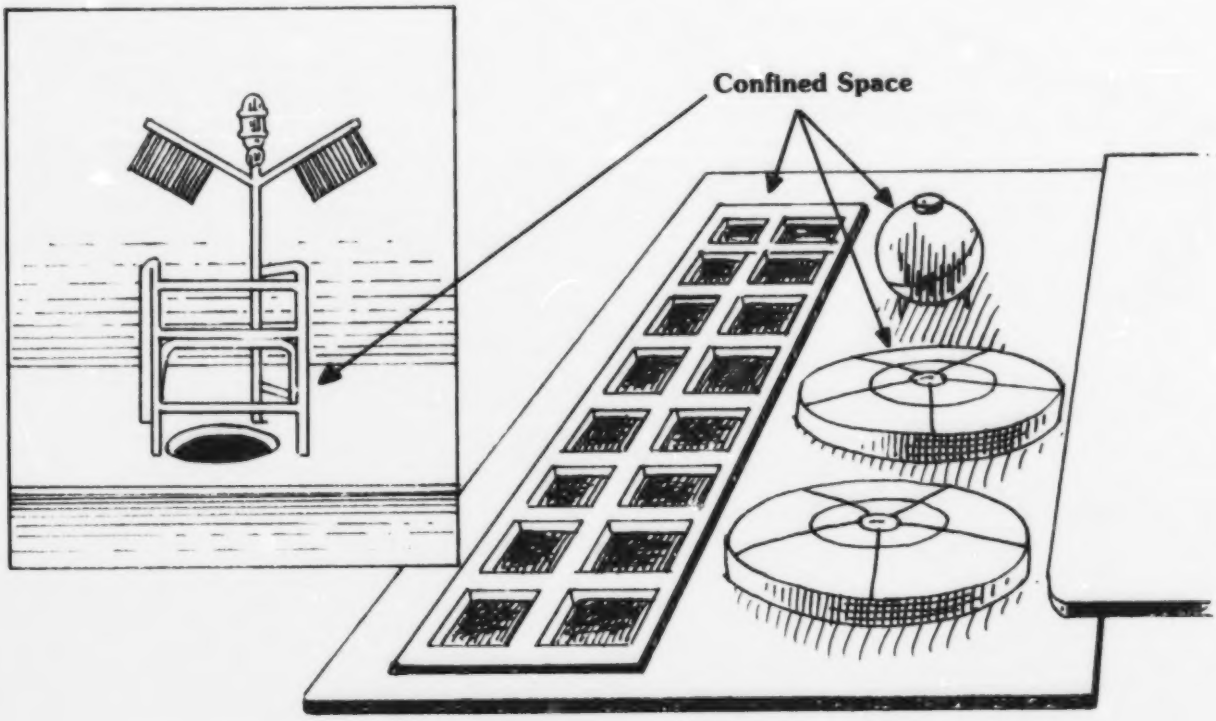



**Manure Pits, Well Pits**

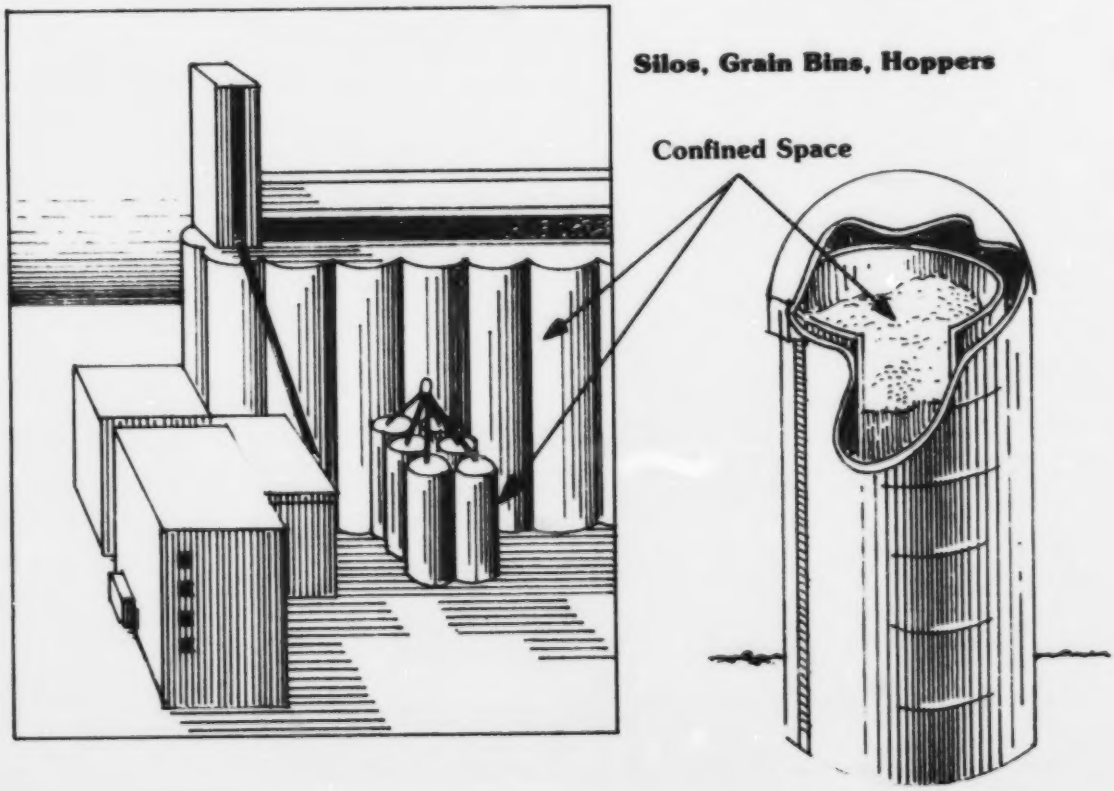




**Sewage Handling System**




**Silos, Grain Bins, Hoppers**



**It is recommended practice to identify and record the confined space work areas present at your workplace, or associated with your work activities.**

**A confined space work area recording sheet is provided in "Appendix A", so that confined spaces may be**

**a) identified**

**b) potential hazards noted**

**c) required precautions stated**

**Example #1:**

**A fuel storage tank 40 m in diameter, 15 m high, with a ground level side hatch for access, is to be cleaned and the heater coil repaired.**

| Confined Space | Hazards | Precautions |
|---|---|---|
| Fuel storage tank adjacent to grader shed | Explosive atmosphere | Continuous explosive gas monitoring |
| | Oxygen deficiency | Oxygen monitoring/ventilation |
| | Welding | Hot work permit |
| | Access/egress | Emergency rescue provisions |
| | Fluids entering tank | Blanking off lines locking off valves |
| **Example #2** | | |
| Manhole - S.W. corner of 1st Ave. & Main St. | Explosive gases | Continuous explosive gas monitoring |
| | Oxygen levels | Oxygen monitoring |
| | Unknown toxic gases[1] | Supplied Air Breathing Apparatus |
| | Residual chemicals on sewer pipe | Supplied Air and continuous explosive monitoring |
| | Chemicals in effluent (live sewer) | Supplied Air, explosive gas monitoring and full skin (dermal) protection |
| | Micro organisms | Supplied Air, personal hygiene and immunizations[2] |
| | Access/egress | Hositing/retrieving system and harness and lifeline; standby worker equipped with supplied air and emergency rescue provisions, 3rd worker present |
| | Slippery rungs, surfaces | Footwear and traction/grip hoisting/retrieval system and harness and lifeline and standby worker equipped |

**Note: (1) There are approximately 54,000 chemicals used in industry and may be dumped and reacting with each other in sewage handling systems.**

**(2) Immunization may form part of an occupational health service.**

## Hazard/Risk Assessment for Entry into Confined Spaces

**All hazards must be identified before developing an entry program. This assessment must, at least, cover the following:**

**A) Atmosphere**

- Explosive gases/vapours
- Toxic gases/vapours
- Oxygen content - deficiency
  - enrichment
- Fumes, dusts, mists, fogs
- Smoke
- Biological agents

**B) Safety Hazards**

- Entry/exit (access/egress)
- Ventilation systems
- Machinery
- Piping/Distribution systems
- Residual chemicals/materials
- Electrical
- Visibility
- Physical obstacles
- Walking/working surfaces
- Temperature extremes
- Humidity
- Noise
- Vibration
- Radiation
- Hazardous animals

**C) Work to Be Performed**

- Hot work/cold work

**D) Human Factors**

- Phobias
- Mental and Physical condition of workers

# HAZARD ASSESSMENT IN CONFINED SPACES

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| **A. Atmosphere** | | | | |
| **1. Explosive Atmosphere** | Before entering confined space, tests for presence of an explosive atmosphere must be done. It should be noted that air-borne dust from grain, fine ground metals or other materials can form an explosive atmosphere. Explosive gases may displace oxygen. Note: Oxygen enrichment or deficiency can cause error in combustible gas detector readings. | Combustible gas detector - explosive gases must be monitored by equipment that can detect the lower explosives limit (L.E.L.) and upper explosive limit (U.E.L.). Residues may have to be disturbed to allow for release of explosive gases. | Explosion/ burns/multiple injuries/death | 1. **Methane** (or natural gas) $CH_4$ - sources - gas line leaks, decaying matter. May be found adjacent to land fill sites; backed up, sluggish sewers.<br>2. **Gasoline and other solvents** - Storage tanks and adjacent areas, sewer systems, proximity to pipelines, accidental spills may have definite odor. |
| **2. Oxygen a) Deficiency** | **Deficiency** - Acceptable breathing air contains between 19.5% - 21.4% oxygen. Air containing less than acceptable amounts of oxygen is a hazardous atmosphere. | Oxygen detection monitor. | Could result in slowing down of pulse rate, disorientation, unconsciousness, death. | Oxygen ($O_2$) deficiency can be caused by displacement by other gases, or by biological or chemical reactions (rusting, burning.) |
| **b) Enrichment** | **Enrichment** - An atmosphere that contains more than the acceptable amount of oxygen (21.4%). Oxygen enrichment can cause an error in explosive meter readings. | Oxygen detection meter.<br>Note: Some equipment incapable of detecting for oxygen enrichment. | Creates explosive atmosphere, increases rate of chemical reaction. | Enrichment may be caused by improper blanking of oxygen lines, leaking fuel-gas, welding equipment, ventilation with oxygen instead of air. |
| **3. Toxic Gases, Vapour** | Testing with appropriate detection equipment shall be undertaken to determine the presence of toxic gas(es) to create and maintain a safe environment. | **Monitors** - specific testors must be used for specific toxic gases, e.g. $H_2S$ monitoring. It may be necessary to disturb residue/ sludge to allow for release of toxic gases/vapours. | Can cause euphoria/disorienting effect, drowsiness, headaches, weakness, injury, disability, death. | 1. **Carbon Monoxide** (CO) - colourless, odorless, tasteless and very poisonous. Commonest source - internal combustion engines and decomposition of organic matter. |

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| | | | | 2. **Carbon Dioxide** - ($CO_2$) - Odorless. It is a heavy gas that can concentrate at lowest levels. It displaces oxygen and does not diffuse or mix readily with air.<br>3. **Nitrogen Dioxide** ($NO_2$) - A pungent acrid odor. Product of gasoline and diesel engines.<br>4. **Hydrogen Sulphide** ($H_2S$) - deadly gas commonly found in sewers, manure pits. Produced by decomposition of organic matter. Has a typical rotten egg odor, but higher amounts will kill the sense of smell. |
| **4. Fumes, Dusts, Mists, Fogs** | These hazards are usually recognized visually. | **Monitors** - Testors specific for each fume, dust, mist, fog, must be used. | Explosion, disability, injury, burns, irritation, death poisoning. | 1. **Fumes** - From asphalt, welding, acid fumes from washing process.<br>2. **Dust** - Grain dust, sand blasting (silica).<br>3. **Mist** - Spray application. |
| **5. Smoke** | Smoke is a combination of gases, vapours, fumes and dusts. | Visual - Use appropriate detection (monitoring) equipment to determine presence of toxic agent(s). | All effects of gases, vapours, dusts, mists, fumes. | Result of combustion, e.g. burning materials, smoke from welding. |
| **6. Biological Agents** | Biological agents are found in a variety of locations. Extreme care should be taken when working near health care facilities or industrial processes using biological agents. Conscientious personal hygiene is essential. | Testing for presence of biological agents is very difficult. If type of agent(s) is known, then specific testing may be done. | Ill health, disease, disorders, irritation, death. | 1. Bacteria and viral infection. |

## HAZARD ASSESSMENT IN CONFINED SPACES

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| **B. Safety Hazard** | | | | |
| 1. Entry / Exit (Access / egress) | Openings that are small, narrow or otherwise difficult to negotiate can be a serious hazard. Where self-contained breathing apparatus is being used, openings must be of size to allow worker with equipment properly worn to pass through. Access openings less than 700 mm (28") are not recommended. | Visual identification of obstructions that could interfere with normal movement or emergency rescue. | Injury, disability, death. | 1. Exits at height that could cause falls.<br>2. Constricted openings<br>3. Angled openings<br>4. Exits into traffic and machinery<br>5. Exits at deep depths. |
| 2. Ventilation systems | Lack of adequate ventilation may cause a build up of contaminants etc. Ventilation systems can introduce hazards into the work area, e.g. carbon monoxide (CO) fumes. | - Monitoring (anemometer, smoke tubes for air movement).<br>- Toxic monitors may also be necessary to ensure good quality air. | Explosion, disease irritation, injury, disability, death. | Improper ventilation can result in:<br>1) Oxygen levels variations<br>2) Build up of toxic gases, vapours, dusts, mists, fumes (smoke).<br>3) Introduction of biological agents, toxic gases, explosive gases. |
| 3. Machinery / Mechanical Equipment | 1. Make sure equipment is immobilized (de-energized) so that it will not be a hazard to workers. | Visual and function testing | Injury, disability, death | 1. Drive belts, augers, paddles, scrapers, agitators, pumps. |
| 4. Piping / Distribution Systems | Contents of pipes and supply lines if allowed to enter a confined space can create a life threatening situation for workers. | Monitoring, visual | Chemical poisoning, drowning, burns, injury, disability, death. | Steamlines, liquid distribution lines, feed mills, cement plants. |
| 5. Residual Chemicals / materials | 1. Corrosive and / or toxic chemicals remaining in a confined space. Special attention should be made to ensure that lines, valves, meters are totally drained and properly decontaminated. | Monitoring | Injury, disability, death, explosion. | Storage tanks, digestors, liquid distribution systems, augers. |

## HAZARD ASSESSMENT IN CONFINED SPACES

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| | 2. Material that may be adhered to surfaces/walls of enclosures may collapse.<br>3. Loose granular material that may engulf worker.<br>4. Material that may encapsulate/trap other toxic/explosive materials.<br>5. Flooding by liquids. | Visual, Monitoring. | Engulfment, suffocation - drowning, injury, disability, death. | 1. Silos, grain hoppers, fertilizer storage.<br>2. Sand, grains (e.g. Flax)<br>3. a) Rust build up in fuel storage tank<br>b) sludge prevents release of Hydrogen sulphide ($H_2S$)<br>4. Flooding in underground facilities. |
| 6. Electrical | Sources of unguarded electrical equipment - extreme caution must be taken when using conductive material around electrical surfaces (e.g. ladders, lifelines, steel bars etc.) | Only by qualified personnel | Shock, burns, injury, disability, death. | 1. Underground electrical vaults, and electrical distribution systems.<br>2. Motor control centres. |
| 7. Poor Visibility | Caused by poor lighting obstructions, work process and procedure, fog/mist due to high humidity. | Visual | Injury, Disability, death | Improper/inadequate lighting, poor design of confined space, work process. |
| 8. Physical Obstacles | This would include obstacles that impede movement and performance of work and rescue procedures. | Visual | Inability to remove injured worker, contusions, abrations, fractures, disability, injury, death. | Cross bracing, baffle plates, piping. |
| 9. Walking/Working Surfaces | Surfaces may be irregular in shape, sloped, angled, elevated, slippery, obstructed etc., all of which are slip and fall hazards. Work areas may require toe boards to prevent objects from falling on workers below. | Visual | Injury, disability, death. | 1. Lift stations, aquaducts, dams.<br>2. Work areas that require toe boards to prevent objects from falling on workers below. |

## HAZARD ASSESSMENT IN CONFINED SPACES

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| **10. Temperature Extremes** | Temperature extremes, hot or cold, have definite health and safety hazards, as well as having a limiting effect on the ability of a worker to adequately perform tasks. | Thermometer, Heat Stress - Wet Bulb Globe Thermometer (WBGT) | 1. Cold - Frost bite, loss of coordination, hypothermia, disability, death.<br>2. Heat - heat exhaustion, heat stress, distorientation, death. | 1. Working in freezers, extreme cold climate conditions.<br>2. Working in boilers, super-heated areas (cooling towers), areas that have steam/heat distribution pipes running through work area. |
| **11. Humidity** | High humidity can aggravate several conditions:<br>1) Visibility<br>2) Can cause all types of surfaces to become slippery<br>3) Accelerate heat loss<br>4) Increase chill effect | Hygrometer | Can cause slips, falls; physical discomfort, heat exhaustion, affect performance of tasks. | 1. Boiler Rooms<br>2. Digestors<br>3. Freezers |
| **12. Noise** | If sound levels exceed 80 DBA then work practices shall conform to requirements of current regulations - respecting Hearing Conservation and Noise Control in Workplaces. | Sound level meters | Distraction, stress, disorientation, communication problems, hearing loss. | Sources include operating equipment, such as pumps, jack hammers, grinders, other work procedures. |
| **13. Vibration** | Whole Body vibration is a "general stressor" affecting multiple body parts/organs. | Vibration meter | White finger disease, disorientation, vertigo, circulation and nervous system disorders. | 1. Jack hammers, impact hammers/drills, shakers. |
| **14. Radiation** | 1. Non-Ionizing radiation - ultra violet light, infra-red light - components or sunlight. | 1. Non-Ionizing - specific light meters. | 1. Non-Ionizing topical burns. | 1. Ultra-violet and infra-red light sources. |

| HAZARD | EXPLANATORY NOTES | METHOD OF TEST | EFFECTS OF HAZARD | EXAMPLES |
|---|---|---|---|---|
| | 2. Ionizing radiation - Radioactive materials (uranium)<br>Types: Alpha, Beta, Gamma | 2. Ionizing - Geiger counters, passive dosimeters | Ionizing - Deep body burns, radiation sickness, sterility, death. | 1. X-ray equipment<br>2. Level or density guages in manufacturing processes. |
| 15. Hazardous Animals | Rats, pigeons, and other vermin and their by-products (excrement). | Visual | Disease, injury | Rats, pigeons, bats |
| **C. Type of Work to be Performed** | | | | |
| | 1. Type of work being undertaken can create additional hazards. These hazards created by the work process will have to be considered and planned for to ensure the safety and health of workers in the confined space.<br>2. Hot Work - Where heat used or generated by work process may cause an explosion.<br>3. Cold Work - Situation where toxic substances or other hazards may exist. | Monitoring, visual, pre-job planning, work permit system. | Injury, disability, death. | 1. Welding (hot work)<br>2. Sand blasting<br>3. Bonding Operations<br>4. Grinding<br>5. Using solvents<br>6. Spray painting |
| **D. Human Factors** | | | | |
| 1. Phobias. | Some workers are not suitable for work in confined spaces. As a result of these factors they can cause a worker to injure themselves or others. | Medical interview screening. | Injury, disability, death. | 1. Claustrophobia<br>2. Fear of heights |
| 2. Mental & Physical Condition | All workers must be mentally and physically capable of performing the work. | Visual, medical examination (pre-employment, annuals) | Injury, disability, death. | 1. Intoxication (alcohol, drug abuse)<br>2. Impairment (prescription medication) |

## RECOMMENDED WORK PRACTICES

**The development of work practices ensures that all workers involved in confined space work are following acceptable methods that are standardized. Thereby, the risk of injury/death to themselves and others is reduced.**

**1. Training Programs**

**The nature of the hazards encountered in confined space work requires that an effective training program be developed that will provide safe work practices and techniques. The training program should be based upon the specific hazards to be encountered. It should be given to all individuals who will supervise, perform the work, or be assigned as standby or rescue persons.**

**a) Training Instructors - It is essential that the instructor have a thorough working knowledge of the following:**

**i) The confined space associated with the work activity**

**ii) Hazards involved**

**iii) Work practices and techniques**

**iv) Test requirements**

**v) Safety Equipment - Respirators**
**- Clothing**
**- Additional protection**

**vi) Rescue**

**vii) Evaluation**

**b) Workers - Training of workers entering and working in confined spaces is critical. To ensure worker safety, the training program should be specially designed for the type of confined space involved; the problems associated with normal entry and exit; and rescue procedures. Training should cover all types of confined spaces that may be encountered in the workplace or job description.**

**An effective training program should cover the following:**

**i) Fundamentals of hazard/risk assessment**
**ii) Lockout/blanking off procedures**
**iii) Monitoring equipment and use**
**iv) Use of applicable respiratory equipment (as per CSA Z94.4 1982 or current edition)**
**v) Safety equipment use**
**vi) Emergency entry/exit (rescue) procedures**
**vii) Communications**
**viii) First Aid and cardio-pulmonary resuscitation (C.P.R.)**
**ix) Work procedures**
**x) Fire protection**
**xi) Rescue drills**

For training to be effective, class room, on-the-job training and/or simulated conditions should be used.

On-the-job training should be closely supervised until the worker has a complete understanding of potential hazards and an adequate understanding of confined space work practices.

Evaluation of the worker's competency should take place to determine the need for re-training and upgrading. This should be done periodically, based upon employee evaluation and changes in the workplace.

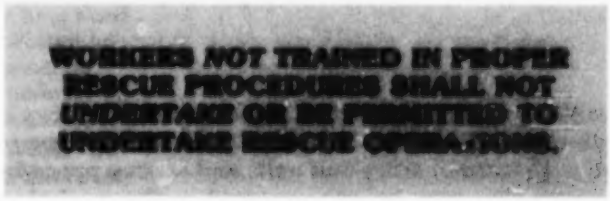
**2. Rescue**

Confined spaces must be considered to be I.D.L.H. (Immediately Dangerous to Life and Health), unless demonstrated otherwise. Emergency rescue procedures must be planned and prepared for all confined space entry work, and must be in place **before** any work commences. It must be noted that after a very short period of time (approx. 4 min.) without breathing, a worker can suffer permanent brain damage due to lack of oxygen.

The standby worker must be equipped to immediately effect a rescue. **There must be a top-man in attendance at all times.**

**Only** workers properly trained and equipped for the confined space rescue shall attempt the rescue. Rescue personnel must be physically capable of carrying out a rescue, and must be trained in first aid and cardio-pulmonary resuscitation (C.P.R.)

Communications must be available at the worksite to emergency response organizations (Fire Department, Ambulance).




**3. Documented Work Procedures**

The objective of documented work procedures is to establish one standard job procedure that is on record and available for reference and continued use.

It can be a tool for teaching the most systematic way to do a difficult job consistently with maximum efficiency.

All factors (including safety, quality and production) must be included in the analysis and procedures, as well as the orderly sequence of steps that will accomplish the job efficiently.

**4. Work Permit Systems**

**The purpose of the permit system is to ensure that the existing hazards of a confined space have been properly assessed (evaluated), and that necessary preventive and protective measures and procedures have been taken to ensure the health and safety of workers involved in confined entry work.**

**The permit system provides a checklist to verify that inherent hazards and hazards associated with or introduced by the work process are taken into consideration.**

**A permit system should include the following:**

**a) Date, location and description of work to be done.**

**b) Hazards that may be encountered.**

**c) Complete isolation list - blanking and/or disconnecting**
- **electrical lock-out**
- **mechanical lock-out**
- **other**

**d) Special clothing and equipment**
- **Personal protective equipment and clothing**
- **Safety harness and retrieval system**
- **Special tools for hazardous location work**

**e) Atmospheric test readings**
- **Explosive levels and/or flammability levels**
- **Oxygen levels**
- **Toxic substances**
- **Others, if necessary**

**f) Atmospheric monitoring (and type) while work is being performed.**

**g) Personnel trained and have complete understanding of the hazard**

**h) Stand by worker(s) as named on permit**

**i) Authorization for work to be done by supervisor**

**j) Emergency procedures in place and first aid location**

**Work permits should be dated and have an expiration time that will be valid for only one shift. Each shift shall have the permit updated with same requirements.**

**Due to the diversity of work in confined spaces, it is not possible to have a work permit that covers every aspect. Therefore, each work situation should be appraised and a permit designed to cover it.**

**Examples of the types of work permits include:**

a) **Hot work permit** - where heat used or generated in work process is of sufficient intensity to cause an explosion or fire.

b) **Cold work permit** - where hazards from toxic gases, fumes, dusts, mists, fogs, corrosive substances, biological agents exist or may exist.

c) **Safety Work Permits** - Work that involves steam, air, water, electricity.

d) **Entry Permits** - For entering into confined spaces.

**An example of a confined space work permit is found in "Appendix B".**

**5. Lock-out Provisions**

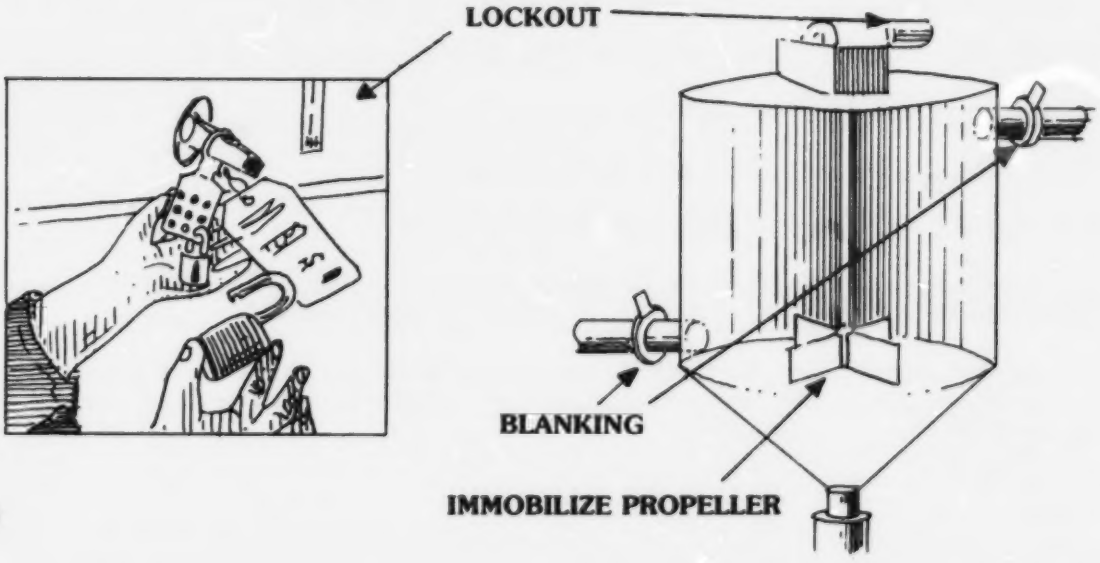
**All mechanical equipment in the confined space must be disconnected from power source at the disconnect box and the controls "locked out" to prevent accidental start-up. This includes electrical, mechanical, steam, compressed (pneumatic) gas, hydraulic, gravity, wind, radiation devices. There shall be only one (1) key for the lock, and it should be in the possession of the worker whose safety is dependent on the lock out.**

**A fully documented and established tag-out system having the same effect as a lock-out system may be used where a lock-out system is not practicable.**

**6. Blanking Off Procedures**

**All lines and systems which may permit the entry of hazardous materials into confined space must be blanked off. Material used in construction of the blank must take the line pressure and corrosion properties into consideration.**

**Where it is impractical to employ blank or blinds, as in welded piping systems, written work procedures shall be developed and implemented to ensure equivalent protection to all workers exposed to the hazard.**



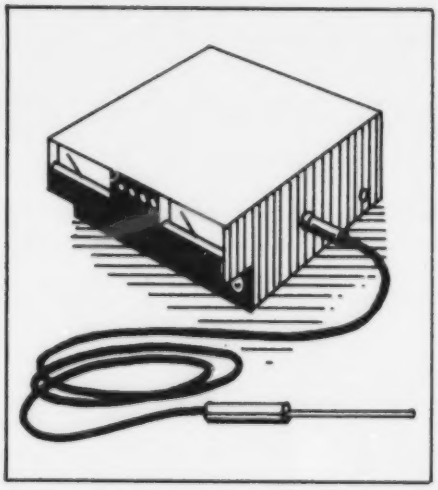
## 7. Monitoring

**Before entering any confined space, it is important that appropriate monitoring equipment is used to test for the presence of hazardous atmospheres (explosive gases, oxygen levels, toxic gases etc.)**

**Only workers who are trained and qualified to use the monitoring equipment should carry out monitoring. The training must include instrument calibration, maintenance, proper interpretation of instrument readings and warning signals.**

**All monitoring equipment must be serviced, maintained and calibrated to ensure proper working order before use. Equipment service log books should be maintained for each piece of confined entry monitoring equipment. An example is found in "Appendix C".**

**Continuous Monitor**



**Guidelines of acceptable levels of airborne toxic chemicals can be found in a current edition of "Threshold Limit Values" indices book prepared by American Conference of Governmental Industrial Hygienists.**

**If all airborne (breathing) hazards are not known, then workers entering confined spaces must have approved pressure-demand, supplied air breathing apparatus, and continuous monitoring equipment for explosive atmosphere. The atmosphere should not be more than 10% of the lower explosive limit. Monitoring alarm systems shall not be set to activate above 20% L.E.L.**

**8. Ventilation and Purging/Inerting**

a) **Ventilation** - A method of forcing air into a confined space near the bottom using a mechanical device. This is done if hazard/risk assessment and monitoring indicate ventilation is required. Re-testing must be carried out after ventilating the space for an appropriate time, and before any worker enters.

b) **Purging** - A method of removing contaminants from a confined space by using liquids (water) or by non-flammable gases (carbon dioxide or nitrogen).

c) **Inerting** - The process of introducing a substance, usually a gas to make the contaminants unreactive.

**9. On-Site Work Requirements**

a) A qualified worker who is experienced and trained with all aspects of confined entry work shall be present to supervise workers who are in confined spaces and shall be responsible for all work and rescue procedures at all times.

b) An appropriate number of standby workers trained in first aid (CPR) and rescue procedures must be in attendance and continuously monitor the worker(s) in the confined space. At all times, the standby worker must be prepared and be appropriately equipped to carry out a rescue. When entry is from the top, it is recommended that there be at least two (2) stand-by workers.

c) A communication system must be provided from the worksite to outside rescue agencies. It is recommended that the outside rescue agency be familiar with the workplace and working procedures.

d) A communication system must be in place between the worker in the confined space and the standby worker. This may be visual, two-way radios, or hard line communications.

e) **Barricades** - shall be provided to keep vehicles and pedestrian traffic clear of the area, as required.

f) **Fire Safety**

Where the potential for fire and explosion exists, all ignition sources must be eliminated. Compressed gas cylinders shall not be taken into a confined space (this does not apply to breathing air cylinders). Welding and cutting hoses shall be brought in only for the immediate use, and shall be removed immediately after completion of the work.

Adequate fire fighting equipment shall be readily available. Special non-sparking (non-ferrous) tools should be used where necessary.

g) **Electrical Safety**

Lights and other electrical equipment must meet the requirements of the Manitoba Electrical Code. Ground fault circuit interrupters may be used as an additional protection for operators of electrical equipment.

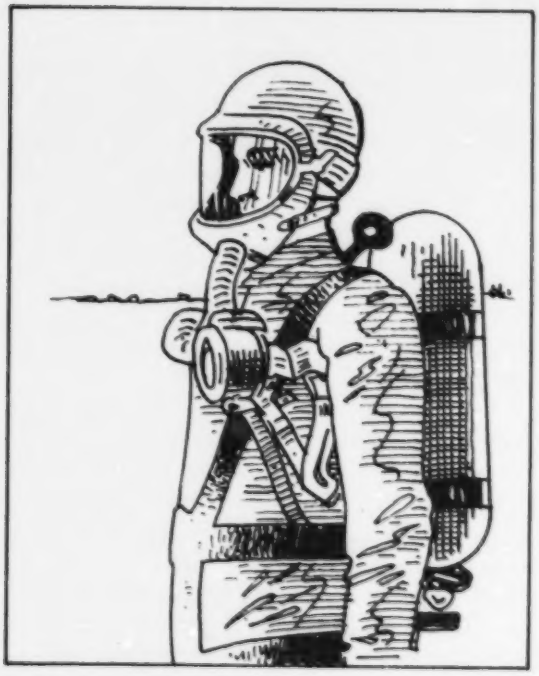
## 10. Safety Equipment For Confined Space Work

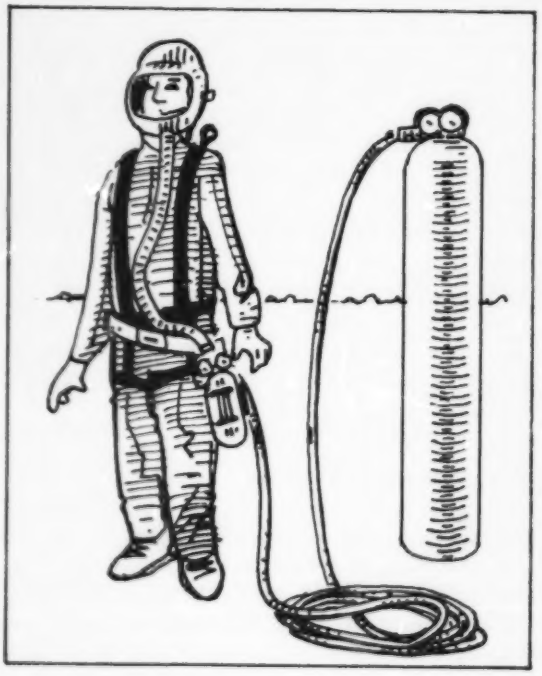
**A worker entering a confined space shall be equipped with all safety apparatus, testing and monitoring equipment relative to the hazard/risk assessment for that confined space.**

**a) Supplied Air Breathing Apparatus - If hazard/risk assessment recognizes need for breathing apparatus, only two types may be used in confined spaces. Both are "supplied-air" pressure-demand type (as per CSA standard Z94.4 - M1982 or latest edition). Entry into confined spaces using breathing apparatus must also include continuous explosive atmosphere monitoring. Air quality of breathing apparatus must meet CSA standard.**

**i) Self-contained breathing Apparatus (S.C.B.A.)**

**Self-contained breathing apparatus provides complete respiratory protection in toxic gases and where there is oxygen deficiency. The wearer is independent of the surrounding atmosphere because the worker is breathing with a system admitting no outside air.**





**ii) Airline Respirators**

**This is a variation of the self-contained breathing apparatus. The back-mounted tank is replaced by a suitable compressed air source which supplies breathing quality air to the worker. While this apparatus is lighter to wear, it restricts the user's movements to the length of the hose. An escape bottle must be worn with this type of apparatus to provide an emergency supply of air. If a compressor is used, it must be an approved type.**

**Note: In the presence of chemical irritants, a full face piece is necessary, as well as full body protection.**

**b) Parachute Harness with Lifelines**

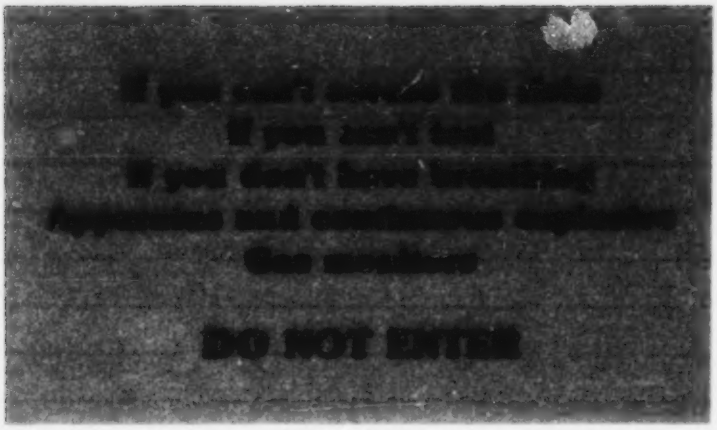
**An acceptable parachute-type harness that will facilitate rescue through a narrow opening is required. The lifeline cable must be a minimum of 3/16" wire rope or other acceptable rigging.**

**c) Hoist/Retrieval System**

**All hoisting components shall be capable of supporting a worker with a four-to-one safety factor. All hoists must be equipped with an adequate brake mechanism that allows for immediate fall arrest. The hoisting mechanism must be capable of immediate retrieval of the worker at all times. Any retrieval system must be capable of removing a worker within two and a half minutes (2½ min.) or less. Shop fabricated hoists must be engineer approved.**

**d) Personal Protective Equipment**

**Proper assessment of conditions and work process should identify additional personal protective equipment necessary for the task to be undertaken. The likelihood of accidenal exposure to toxic substances and traumatic injury requires that the need for whole body protection must be considered.**

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**Contact the Workplace Safety and Health Division for more information.**

**945-3446 (24-Hour)**

**Brandon, 726-6376**

**The Pas, 623-7166**

## CONFINED SPACE WORK AREAS

| CONFINED | SPACE | PRECAUTION |
| --- | --- | --- |
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## CONFINED SPACE ENTRY — SAMPLE PERMIT

**Location of Work:** _____

**Description of Work (Trades):** _____

**Employees Assigned:** _____

**Entry Date:** _____ **Entry Time:** _____

**Outside Contractors:** _____

**Isolation Checklist:**

- Blanking and/or disconnecting
- Electrical
- Mechanical
- Other

**Hazardous Work:**

- Burning
- Welding
- Brazing
- Open Flame
- Other

**Hazards Expected:**

- Corrosive Materials
- Hot Equipment
- Flammable Materials
- Toxic Materials
- Drains Open
- Cleaning (e.g. chemical or water lance)
- Spark Producing Operations
- Spilled Liquids
- Pressure Systems
- Other

**Vessel Cleaned:**

**Deposits** _____

**Method** _____

**Inspection** _____

**Neutralized with** _____

**Fire Safety Precautions:** _____

_____

**Personal Safety:**

**Ventilation Requirements**
**Respirators**
**Clothing**
**Head, Hand, and Foot Protection**
**Shields**
**Life Lines and Harness**
**Lighting**
**Atmospheric Gas Tests**

**Communications**
**Employee Qualified**
**Buddy System**
**Stand-by Person**
**Emergency Egress Procedures**
**Training Sign Off (Supervisor or Qualified Person)**_____

| **Tests Performed** | **Location** | **Reading** |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

**Remarks:** _____

**Test Performed By:** _____
**Signature**

**Time:** _____

**Authorizations:**

**Supervisor:** _____
**Prod Supervisor:** _____
**Line Supervisor:** _____
**Safety Supervisor:** _____
**Etc.:**_____ _____

**Entry and Emergency Procedures Understood:**

**Standy-by Person** _____
**Rescue** _____
**Telephone** _____

**Permit Expires:** _____

**Classification:** _____

## Monitoring Equipment Log

1. Make _____

2. Model Number _____ Serial Number _____

3. Type of Monitor _____

4. Date of Purchase _____

Date Calibrated _____ Calibrated By _____

_____

_____

_____

_____

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